



Earth Science at Your Fingertips

FLIPBOOK

EARTH
SYSTEM
VARIABLES

<https://mynasadata.larc.nasa.gov/>

NASA thinks you will “flip out” with this hands-on visualization!

NASA visualizers take data – numbers, codes – and turn them into animations people can see and quickly understand. You can become a data visualizer by creating your own flipbook animations using maps of science variables that NASA scientists commonly study to better understand the Earth System. There are six flipbooks available for different science variables: aerosols, cloud coverage, vegetation concentrations, precipitation, incoming solar radiation, and surface temperature. Each frame in the flipbooks shows monthly averages collected in 2016 and 2017.

The processes in the Earth System take place in and between the Atmosphere, Cryosphere, Hydrosphere, Biosphere, and Geosphere, as well as include energy from the Sun. As we can see, Earth System processes are not bound by oceans, mountains, or country delineations—they are truly global in scope!

ESSENTIAL QUESTIONS:

1. What do the colors in the flipbook represent?
2. How does this variable change over time?
3. Why do you think these changes occur?
4. What is affected by these changes?

MATERIALS NEEDED:



Binder clip



Scissors



Copier Paper

INSTRUCTIONS



- 1** **PRINT** flipbook on cardstock.



- 2** **CUT** cardstock along the dotted line, making 26 frames.



- 3** **STACK** the 26 frames in order. The frames are numbered.



- 4** **CLIP** the stack of frames together, with the binder clip.

- 5** **FLIP** through the stack quickly. Watch and enjoy the animation.



SATELLITE STUDIES: Earth System Science

Satellites collect data to help unlock the unexpected wonders of how our Earth works as a system.

1 CLIP HERE

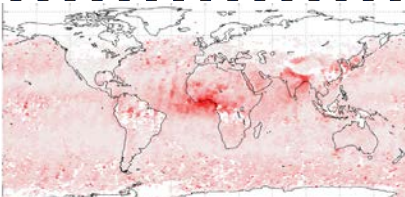


For best results, print on cardstock paper.
Color and data values may appear distorted.

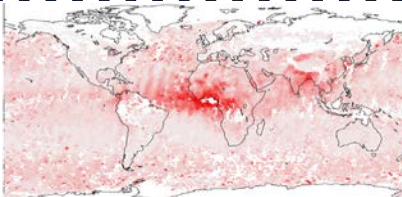
2

Aerosol Optical Depth is a dimensionless value of aerosols (small solid and liquid particles suspended in the atmosphere) distributed in a column of air. Examples of aerosols include windblown dust, sea salts, volcanic ash, smoke from wildfires, and pollution from factories. (MISR)

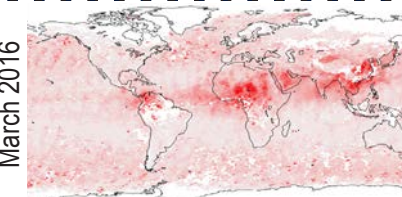
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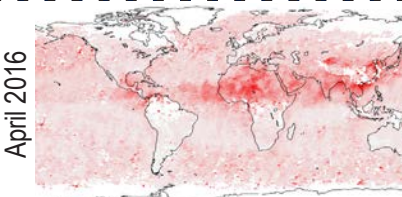
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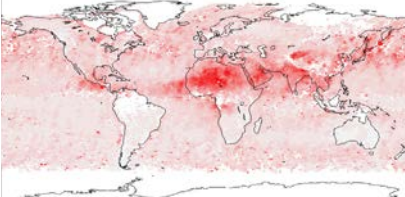
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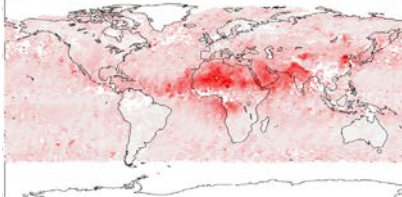
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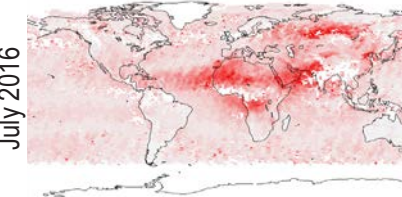
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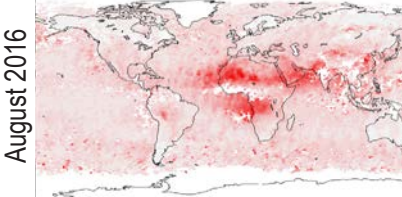
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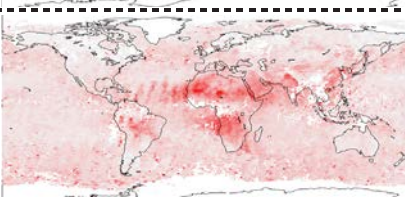
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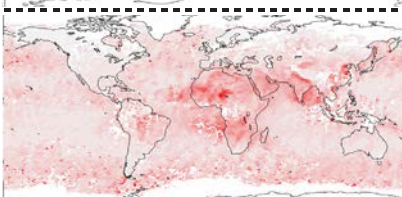
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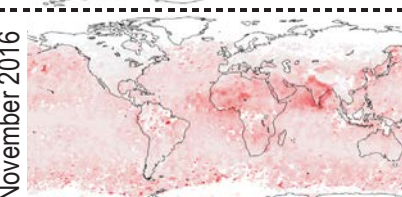
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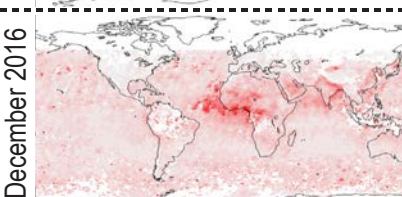
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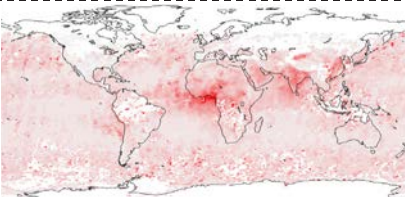
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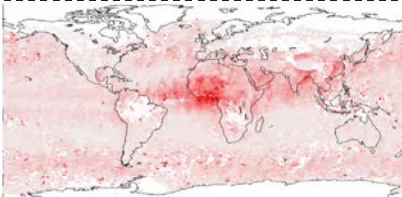
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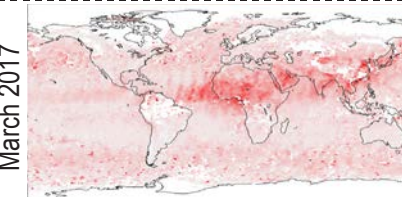
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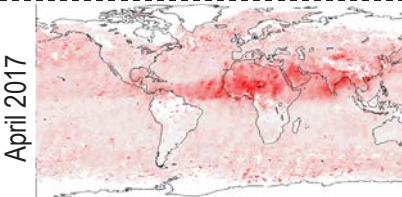
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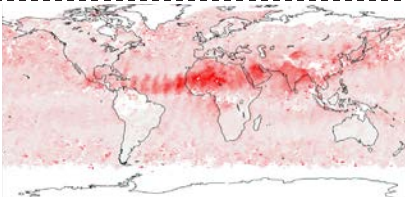
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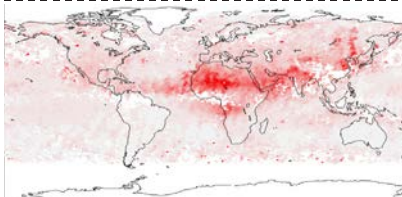
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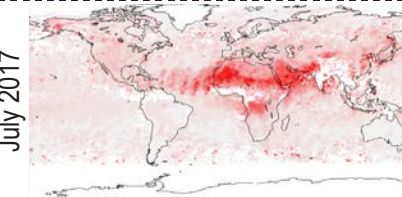
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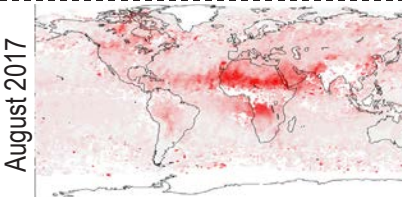
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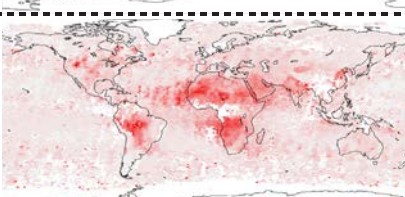
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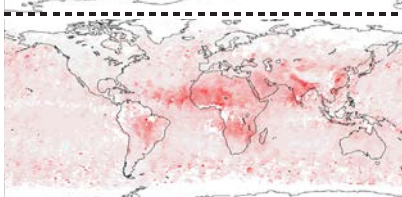
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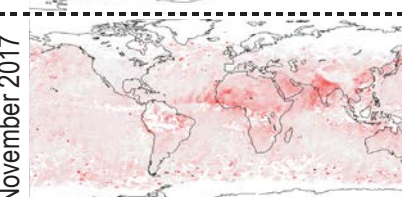
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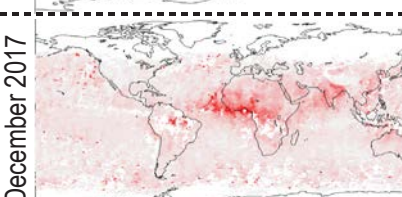
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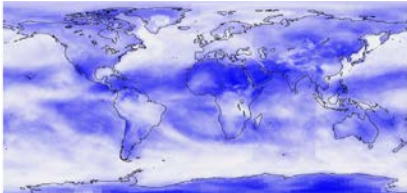


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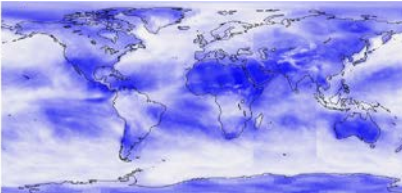
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Cloud Coverage is the amount of Earth's surface at all levels in the troposphere covered by clouds related to the part of Earth not covered by clouds shown as a percentage (%). (CERES)

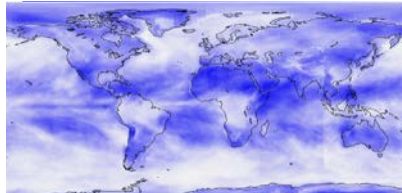
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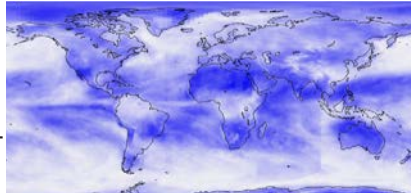
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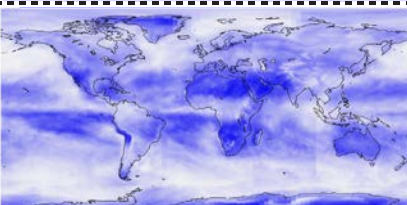
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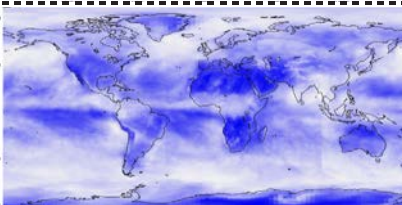
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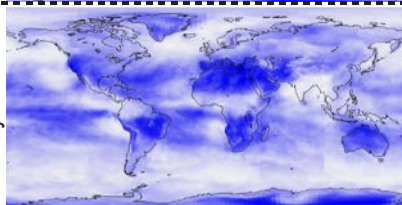
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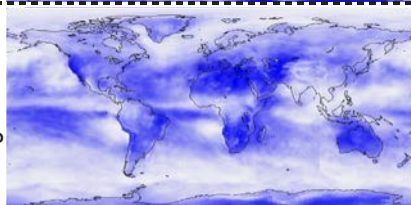
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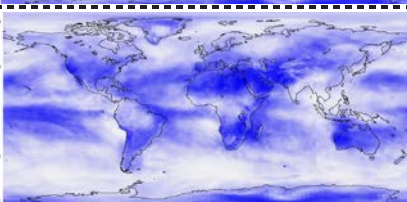
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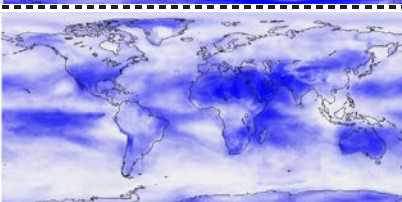
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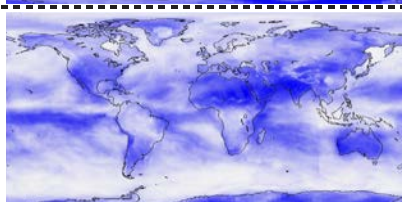
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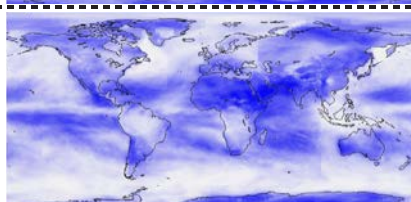
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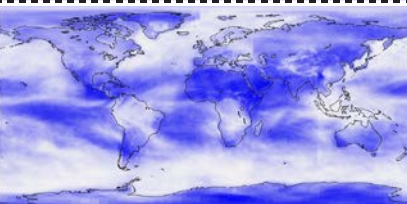
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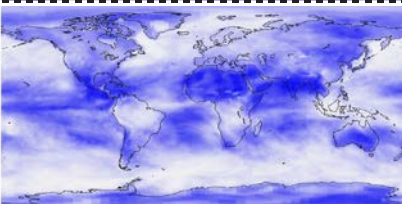
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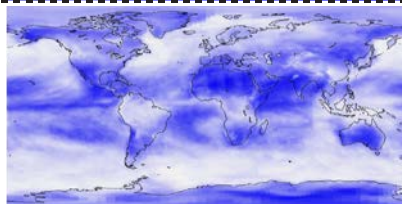
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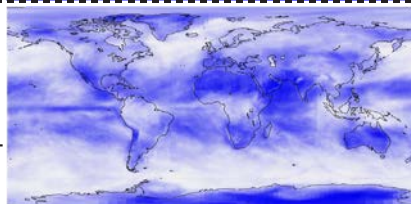
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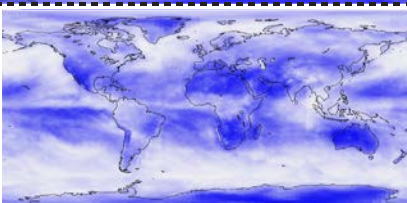
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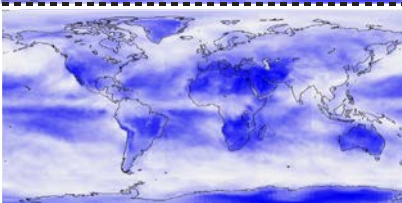
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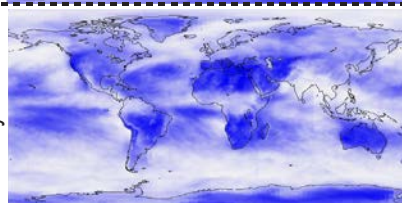
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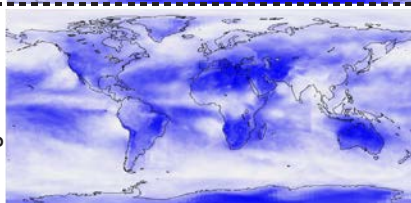
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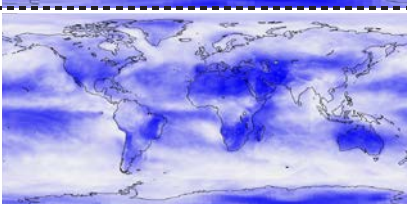
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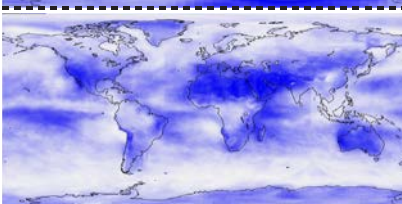
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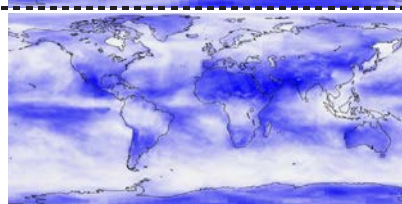
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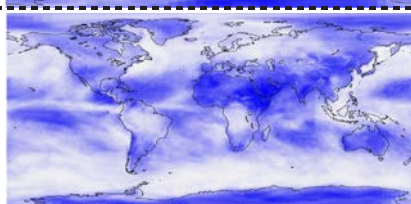
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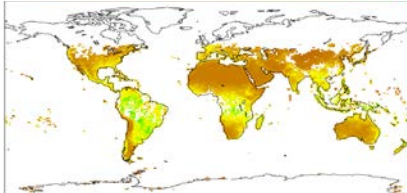


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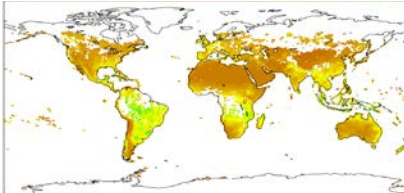
2

These dimensionless data are the "greenness" values of vegetation across Earth's landscapes. This quantity measures the health of plants on the Earth's surface, by how much near-infrared radiation is reflected at the surface. (MISR)

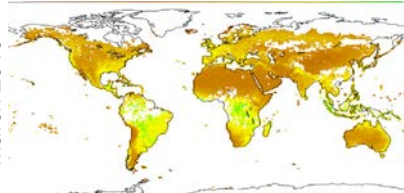
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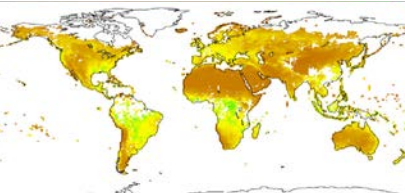
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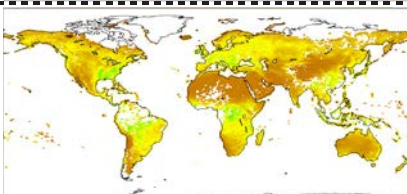
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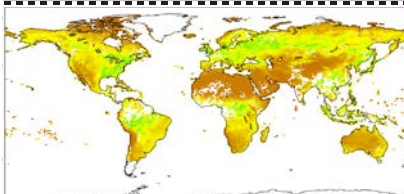
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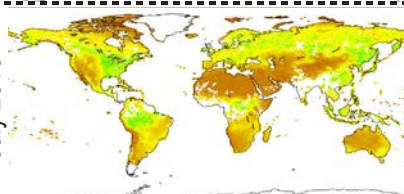
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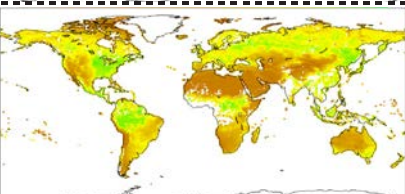
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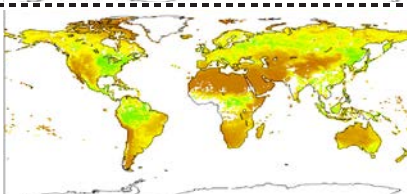
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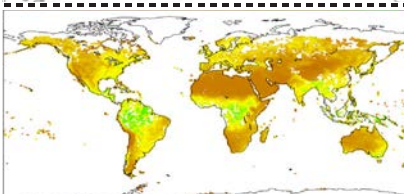
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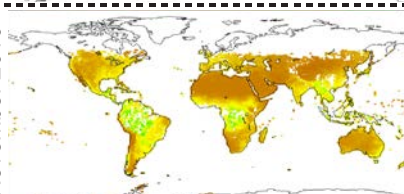
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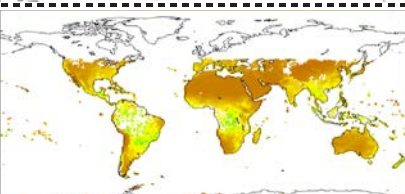
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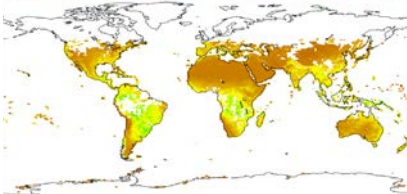
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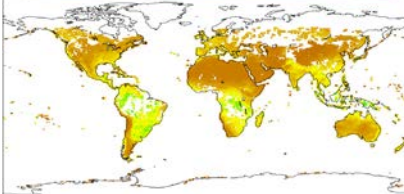
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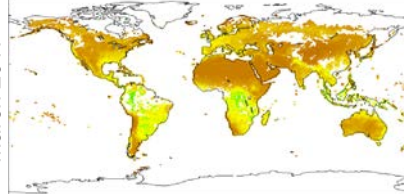
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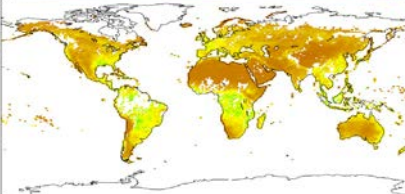
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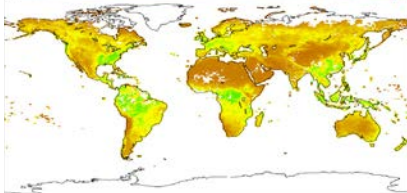
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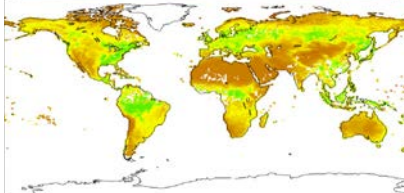
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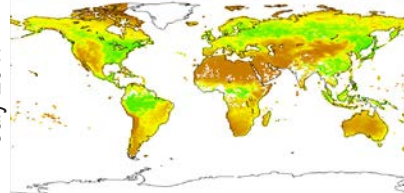
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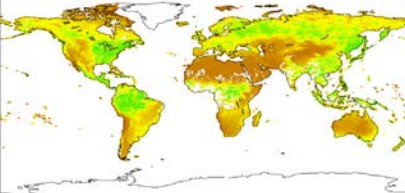
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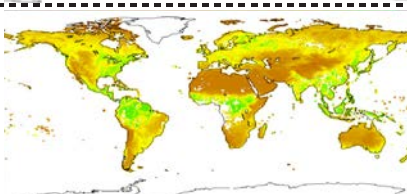
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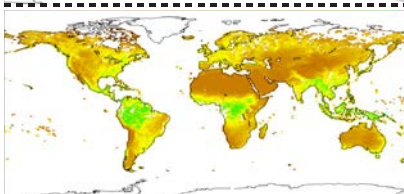
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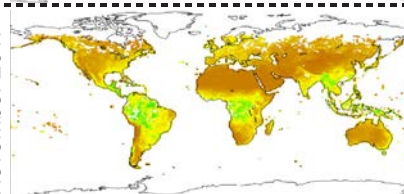
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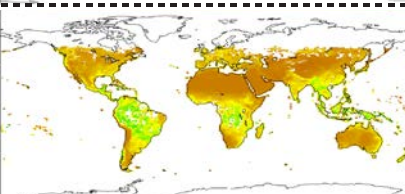
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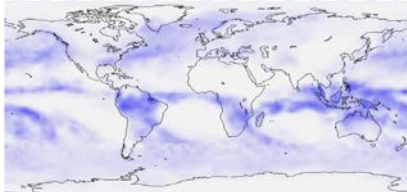
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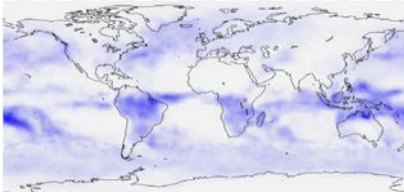
For best results, print on cardstock paper.
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2 Precipitation data show monthly average precipitation rate in millimeters per day, calculated by taking the total precipitation that falls at a location and dividing the number of days in a month. (GPCP)

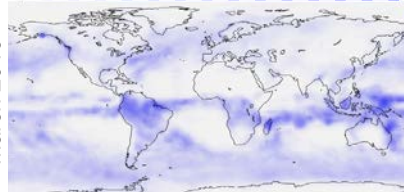
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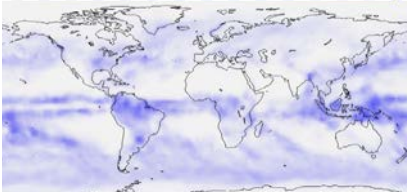
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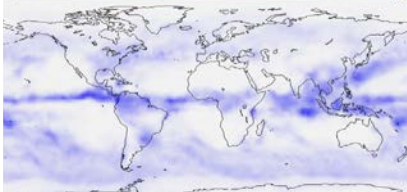
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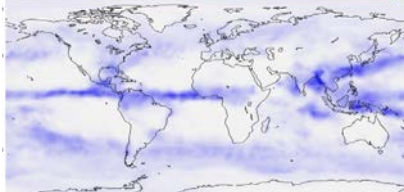
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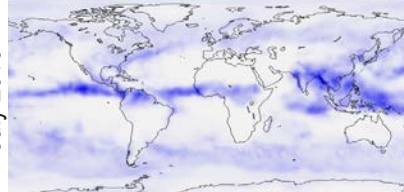
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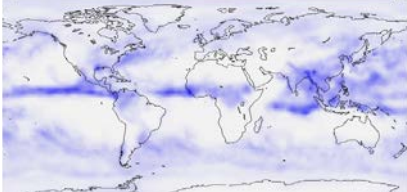
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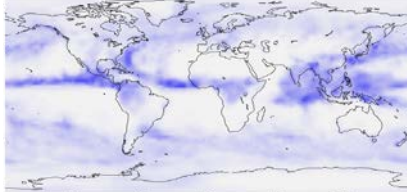
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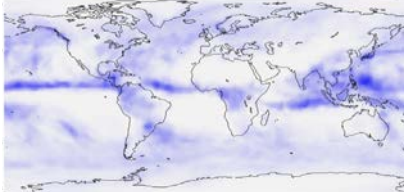
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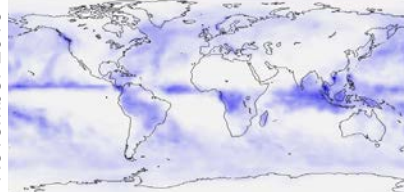
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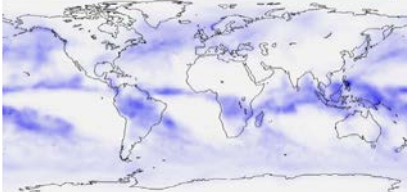
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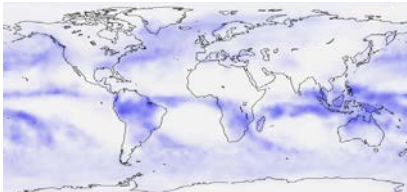
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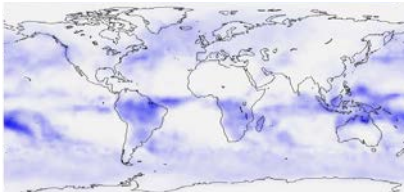
14 December 2016



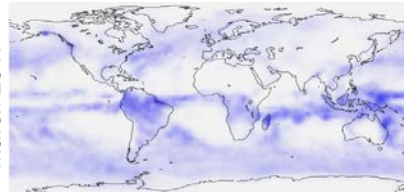
15 January 2017



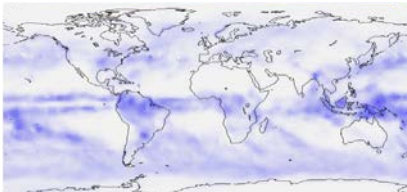
16 February 2017



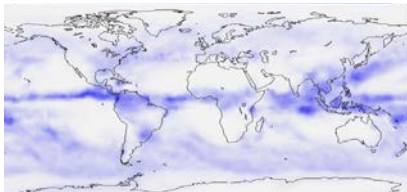
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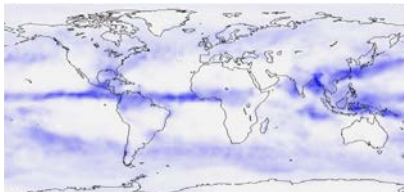
18 April 2017



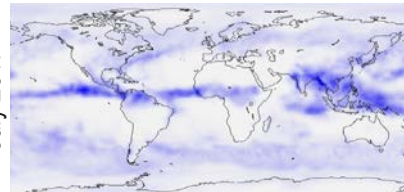
19 May 2017



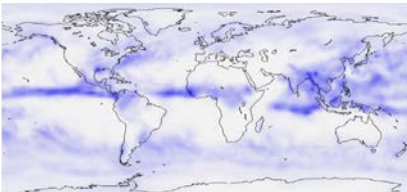
20 June 2017



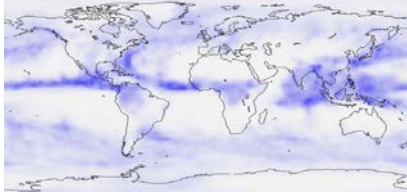
21 July 2017



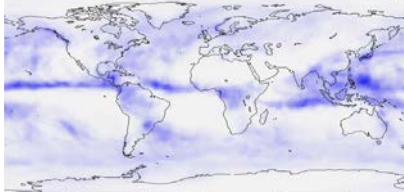
22 August 2017



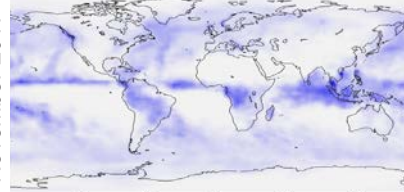
23 September 2017



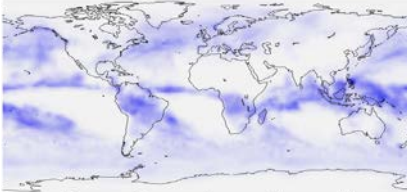
24 October 2017



25 November 2017



26 December 2017



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<https://mynasadata.larc.nasa.gov/>

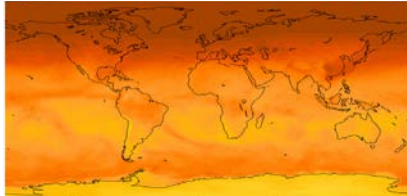


For best results, print on cardstock paper.
Color and data values may appear distorted.

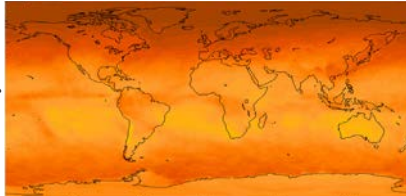
2

Solar Radiation is the amount of incoming solar radiation (i.e., sunlight) reaching the Earth's surface measured in Watts per square meter (W/m^2). The amount of solar energy reaching the Earth's surface varies due to air molecules, cloud, and aerosols. (CERES EBAF)

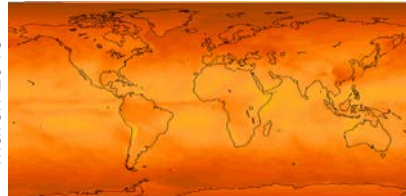
3 January 2016



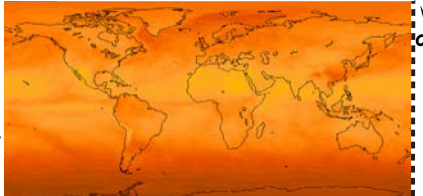
4 February 2016



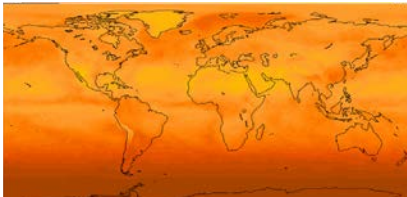
5 March 2016



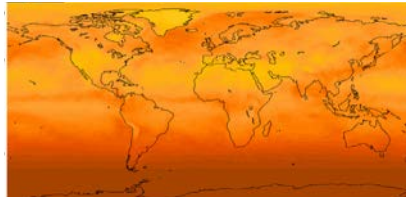
6 April 2016



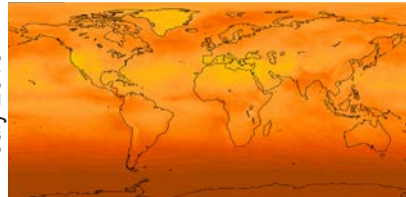
7 May 2016



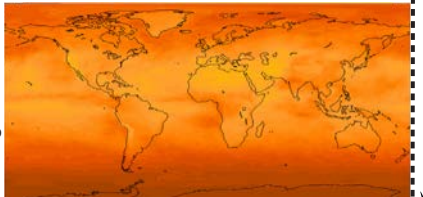
8 June 2016



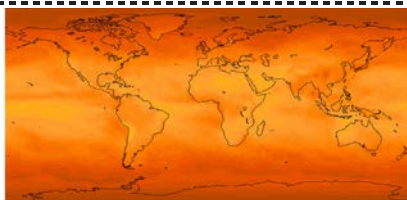
9 July 2016



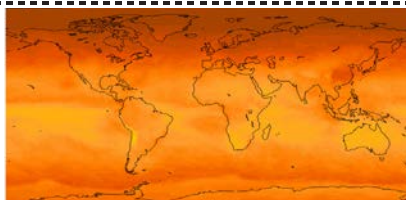
10 August 2016



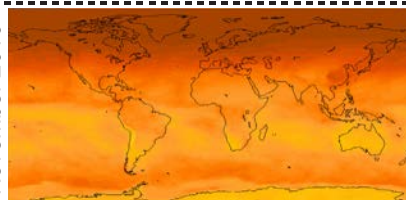
11 September 2016



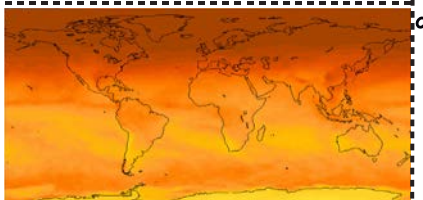
12 October 2016



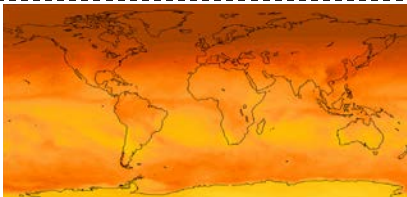
13 November 2016



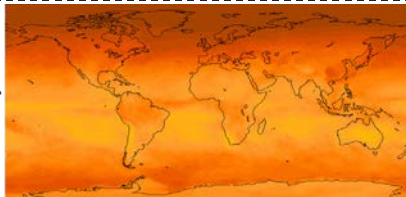
14 December 2016



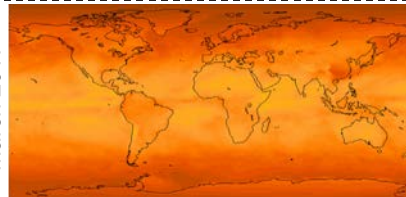
15 January 2017



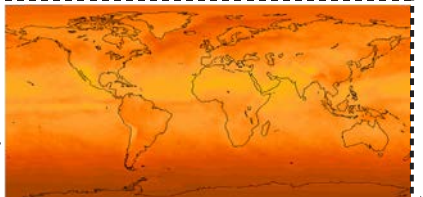
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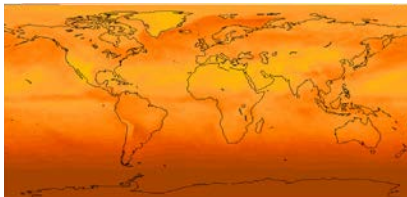
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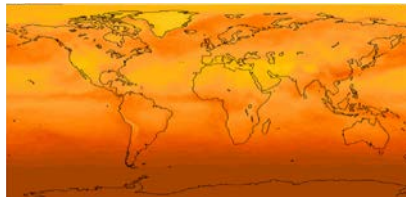
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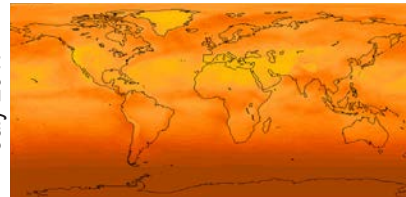
19 May 2017



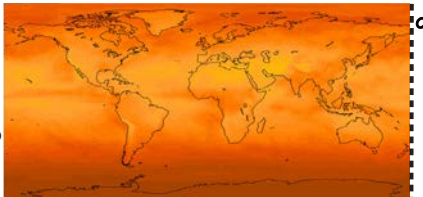
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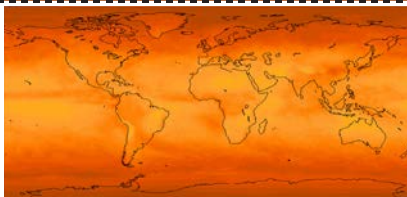
21 July 2017



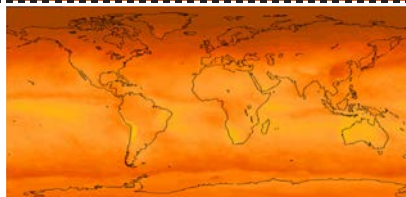
22 August 2017



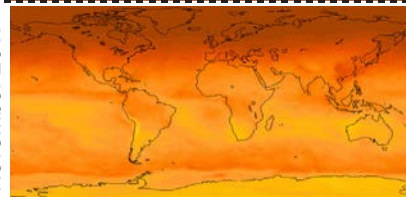
23 September 2017



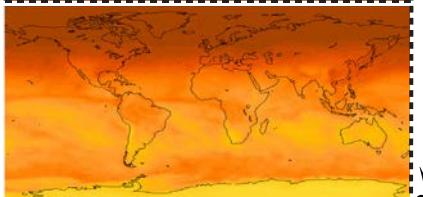
24 October 2017



25 November 2017



26 December 2017



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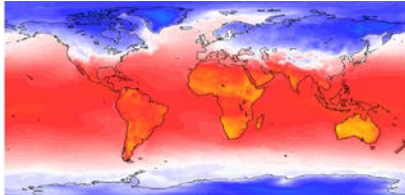


For best results, print on cardstock paper.
Color and data values may appear distorted.

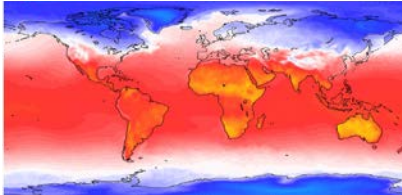
2

The Daytime Surface Skin Temperature is the temperature (in degrees Celsius) right at Earth's surface of the land or ocean in the topmost layer (first few centimeters at the top of the surface), including the plant coverage during the day. (AIRS)

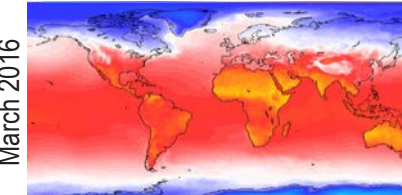
3 January 2016



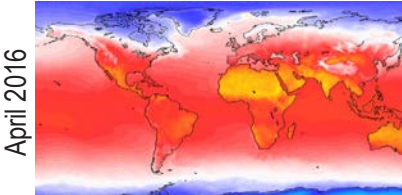
4 February 2016



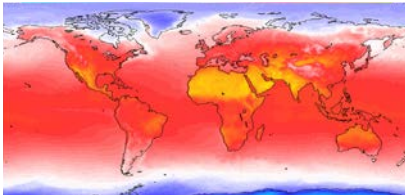
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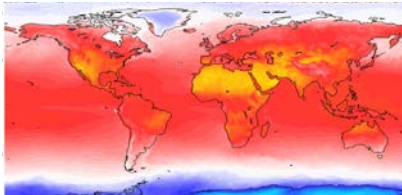
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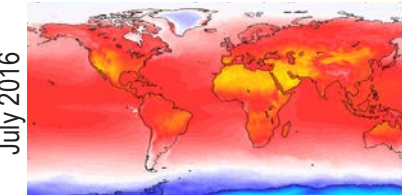
7 May 2016



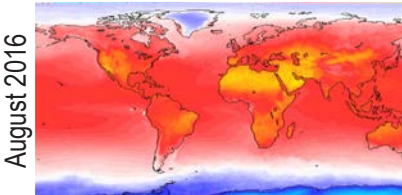
8 June 2016



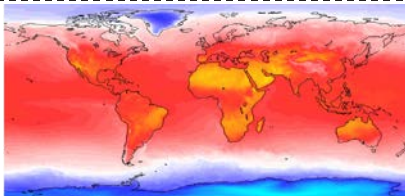
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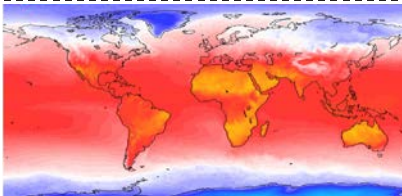
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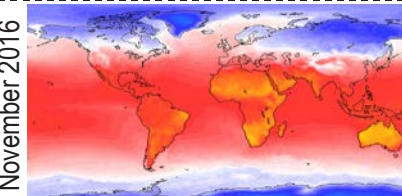
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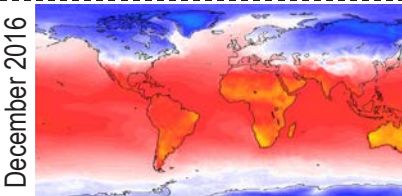
12 October 2016



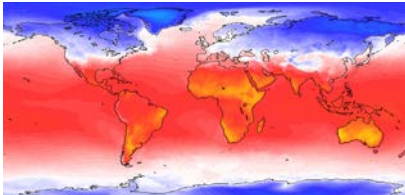
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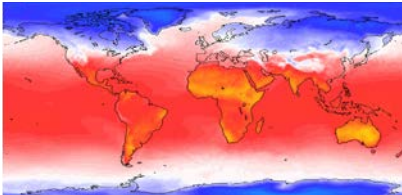
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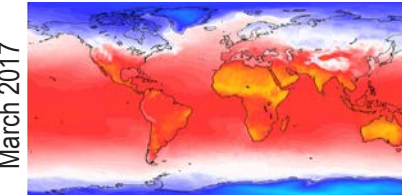
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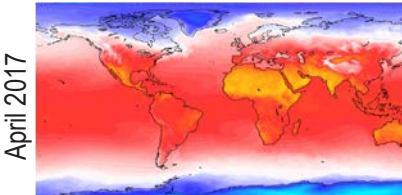
16 February 2017



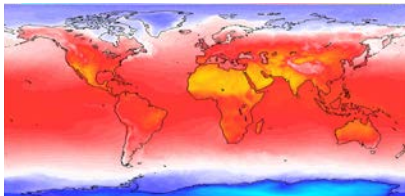
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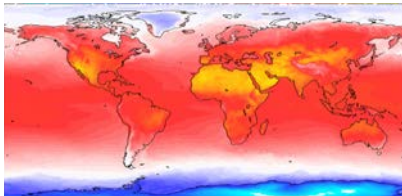
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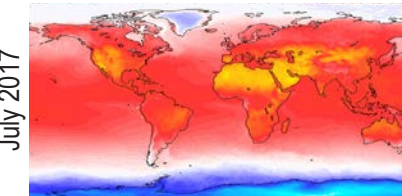
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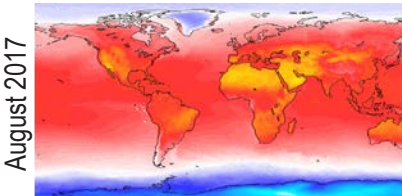
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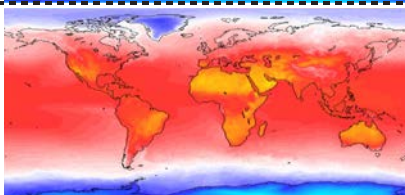
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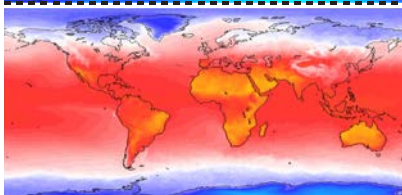
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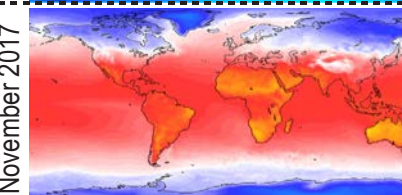
23 September 2017



24 October 2017



25 November 2017



26 December 2017

